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(54) **Suede-like Sheet-form Material**

(57) A needle-punched fleece of completely or partly split staple fibres of crimped multicomponent filaments of the matrix-segment type of the components polyester and polyamide, of which the cross-section in the unsplit state comprises, in addition to the matrix, at least six peripheral segments of wedge-shaped or lens-shaped cross-section which are not completely surrounded by the matrix, the denier of the unsplit filament amounting to from 0.5 to 10 dtex and the denier of the matrix and the denier of the individual segments amounting to from 0.1 to 1 dtex, the segments showing a difference in shrinkage of at least 10% in relation to the matrix, the multicomponent fibres being arranged at least partly in bunches in the fleece, the polyurethane being synthesised from polyglycols, diisocyanate and low molecular weight glycols as chain-extenders and the fibres, over at least 30% of the surface thereof, having no permanent bond with the impregnating composition surrounding them is disclosed.

The multicomponent filaments are crimped, stapled, corded and needled, the thus-produced fleece is condensed by more than 30% by shrinkage, the fleece is impregnated with a solution of a polyurethane having a gel-forming temperature higher than room temperature, the polyurethane is coagulated by cooling in air and/or by treatment with a coagulating bath which contains a non-solvent for the polyurethane, and the fleece is smoothed on one or both sides after washing and drying.

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SPECIFICATION

Suede-like Sheet-form Material

This invention relates to a suede-like sheet-form material; more particularly, it relates to a suede-like product consisting of a sheet-form textile of multi-component fibres which has been treated with a polyurethane solution.

There are already a large number of synthetic products which are used as a suede substitute. There are also numerous references in literature to processes for producing a material of this type.

For example, German Auslegeschrift No. 2,703,654 describes a composite textile material containing a woven fabric or knitted fabric and at least one fleece coupled fibre-to-fibre therewith. This composite textile material is said to be suitable as a substrate for artificial leather.

There are numerous other publications in which woven fabrics or knitted fabrics are used as interlinings in artificial leather.

US Patent No. 3,932,687 describes a support material which is said to be suitable for artificial leather. The material in question is a fleece produced from certain composite fibres, namely so-called "island/matrix" composite fibres. A fleece of extremely fine fibres is obtained by dissolving out the matrix component.

The production of synthetic suede-like materials of this type is complicated and laborious. The properties thereof are also unsatisfactory. Thus, products in which a knitted fabric or woven fabric is used as interlining are relatively inflexible. If a fleece is used in hitherto known manner, the strength of the material is not entirely satisfactory. Difficulties are also involved in the production and handling of very fine deniers. It is also difficult to prevent the formation of a bond between the fibres of the textile interlining and the polyurethane used as the impregnating agent.

Accordingly, there is still a need for an improved process for producing suede-like products, which above all may be carried out without difficulty, and for a synthetic suede material having improved properties.

Accordingly, an object of the present invention is to provide a suede-like product which may be simply and inexpensively produced, combines high mechanical strength with suppleness, has a pronounced writing effect, is easy to print on, has interesting surface patterning possibilities, is versatile in its potential applications and, above all, may be used as clothing leather for a variety of purposes.

According to the present invention, this object is achieved by a suede-like product based on a polyurethane-impregnated sheet-form textile which is characterised in that the sheet-form textile is a needle-punched fleece of completely or partly split staple fibres of crimped multi-component filaments of the matrix-segment type of the components polyester and polyamide, of which the cross-section in the unsplit state comprises, in addition to the matrix, at least six peripheral segments of wedge-shaped or lens-shaped cross-section which are not completely surrounded by the matrix, the denier of the unsplit filament amounting to from 0.5 to 10 dtex and the denier of the matrix and the denier of the individual segments being from 0.1 to 1 dtex, the segments showing a difference in shrinkage of at least 10% in relation to the matrix, the multicomponent fibres being arranged at least partly in batches in the fleece, the polyurethane being synthesised from polyglycols, diisocyanate and low molecular weight glycols as chain-extenders and the fibres, over at least 30% of the surface thereof, having no permanent bond with the impregnating composition surrounding them. The denier of the matrix and the denier of the peripheral segments may be different.

Preferably, the denier of the unsplit filament amounts to from 1 to 5 dtex and the denier of the matrix and the denier of the individual segments to from 0.1 to 0.5 dtex. The polyester component may make up at least 10% of the cross-section of the unsplit fibres. Staple fibres having polyamide segments shrunk at least 20% more than the polyester matrix are particularly suitable for the purposes of the present invention.

Multicomponent filaments having a polyamide matrix and peripheral polyester segments are also advantageous. It is favourable for the polyester segments to be shrunk by at least 20% in relation to the polyamide matrix. In one particularly favourable embodiment of the present invention, the polyester component of the multicomponent filaments makes up from 70% to 90% of the cross-section of the unsplit fibres. The polyester components may consist of copolyesters, copolyesters based on terephthalic acid and ethylene and butylene glycol being particularly suitable.

The polyamide component may also consist of copolyamides based on ε-caprolactam and adipic acid/hexamethylene diamine salt.

One particularly suitable impregnating composition contains a polyurethane synthesised from polytetramethylene glycol, ethylene glycol and 4,4'-diphenyl methane diisocyanate.

In general, the suede-like product according to the present invention has an overall density of at least from 0.2 to 5 g/cc, preferably 0.3 g/cc. A density gradient is advantageously present in the product in such a way that the density decreases from the middle to the external surfaces, i.e. to the upper and lower surface. The impregnating composition has a microporous structure in the end product and at least partly forms a tube-like or tunnel-like covering around the fibres, the lumen of the section surrounding the fibres being greater than the volume of the surrounded fibres. The lumen is preferably at least twice as large as the volume. Within the tube-like covering, the fibres are preferably largely arranged without any permanent bond with the impregnating composition surrounding them.

A suede-like product according to the present invention may be produced by a process in which

a sheet-form textile is produced from multicomponent fibres and impregnated with a polyurethane solution and which is characterised in that a fleece is produced from staple fibres of crimped multi-component filaments of the matrix-segment type, the cross-section of the filaments comprising, in addition to the matrix, at least six peripheral wedge-shaped or lens-shaped segments which are not completely surrounded by the matrix, the thus-produced fleece is mechanically consolidated, condensed by more than 30% through shrinkage and at the same time, the multicomponent fibres are completely or partly divided up into the components, the difference in shrinkage between the components amounting to at least 10%, after which the fleece is impregnated with a solution of polyurethanes based on polyglycols, diisocyanates and low molecular weight glycols as chain-extenders, of which the gel-forming temperature is higher than room temperature and higher than the temperature of the coagulating bath used, if any, after which the polyurethane is coagulated by cooling in air and/or by treatment with a coagulating bath containing a non-solvent for the polyurethane and the fleece is smoothed on one or both sides after washing and drying.

The fleece is preferably mechanically consolidated by needle punching. The fleece may be split one or more times before or after impregnation. It is favourable to use staple fibres of compression-crimped multicomponent filaments. It is preferred to use multicomponent filaments of which the components show a difference in shrinkage of at least 10%, preferably at least 20%, when treated with methylene chloride at room temperature. In one particular embodiment of the process, multicomponent fibres are used of which the components show a difference in shrinkage of at least 20% when treated with water. It is favourable to use multicomponent filaments having a matrix component of polyamide and peripheral segments of polyester. It is advantageous for the polyester to make up from 70 to 90% of the cross-section of the multicomponent filaments.

A solution of polyurethane based on polytetramethylene glycol, ethylene glycol and diphenyl methane diisocyanate is particularly suitable for impregnating the fleeces. The polyurethane preferably contains a light stabiliser, particularly the product currently available under the trade name of "Irganox 1010".

The shrinkage of the fibres in the fleece is preferably initiated by treatment with methylene chloride. The methylene chloride may contain from 0.5 to 5%, by weight, of a brightening agent soluble in methylene chloride, particularly the product currently available under the trade name of "Soromin AF". It is also possible to use dimethyl formamide having a temperature of more than 120°C for initiating shrinkage.

In one particular embodiment, the fleece is asymmetically impregnated. A process of the type disclosed in published G.B. Patent Application No. 2,015,421 is particularly suitable for the production of multicomponent filaments of the type used in accordance with the present invention. Of the various cross-sections shown in this reference, the cross-section shown in Figure 6 is particularly suitable for producing the suede-like product by virtue of its wedge-shaped segments. Cross-sections of the type shown in Figure 6 enable the multicomponent fibres to be subjected after spinning to various treatments, such as drawing, crimping, the application of specialised preparations and cutting, without any significant separation occuring between the matrix and the segments. Splitting into the individual components is only obtained by initiating the shrinkage by treatment with a specialised agent.

A "lens-shaped" cross-section of the segments is to be understood to be any of the cross-sectional forms which are illustrated in conjunction with the segments in Figures 1 to 4 of the above-mentioned reference. It is pointed out that Figure 1 is only intended to illustrate the expression "lens-shaped cross-section" as applied to the segments, the overall cross-section shown in this Figure not being particularly suitable because the cross-section only has three peripheral segments.

The as yet unsplit multicomponent filaments produced in accordance with the above-mentioned reference are then crimped in the conventional way, compression crimping being particularly suitable.

Where compression crimping is used, it is important to ensure that the arcs are not too sharp-edged because the multicomponent filaments may occasionally be minutely split into individual components thereof at the kinks. Such partly split multicomponent filaments may give rise to difficulties during formation of the fleece. With the normal setting, however, this is not the case so that the multicomponent filaments are able to undergo compression crimping largely unsplit. It is important that the pre-treatments of the fibres should not be accompanied by any fixing in the sense that the shrinkage capacity inherent in the multicomponent filaments from the previous history thereof is reduced. Thus, it is not advisable to steam the filaments and to dry them at elevated temperatures. The shrinkage capacity, i.e. the difference in the shrinkage behaviour of the polyester and polyamide components, is best determined by a treatment in methylene chloride as described in the above-mentioned reference. The shrinkage in methylene chloride should amount to at least 10%, preferably to more than 15% or to even more than 20%.

Conventional polyesters and polyamides may be used as the respective components in the production of the multicomponent filament. Polyethylene terephthalate is particularly suitable for use as the polyester component. However, it is also possible to use copolyesters based, for example, on an acid, such as terephthalic acid,

and two different glycols, such as ethylene glycol and butylene glycol. Components of copolyesters generally have better dyeability coupled with a higher shrinkage.

Conventional polyamides, such as poly-ε-caprolactam and the polyamide based on the hexamethylene diamine salt of adipic acid, may be used as polyamides. It is also possible to use copolyamides, copolyamides of ε-caprolactam and hexamethylene diamine adipic acid salt being particularly suitable.

It is also possible to produce the multicomponents in such a way that the peripheral segments consist of polyamide and the matrix of polyester. However, it is preferred to produce a cross-section in which the polyamide forms the matrix and the polyester the segments.

Conventional additives, such as pigments, carbon black, fire-retarding agents and delustering agents, may be added to the individual components.

After compression crimping, the filaments are cut using a conventional cutting machine, into staple fibres having a length of from 30 to 50 mm, preferably about 40 mm, i.e. the staple length to which fibres of the cotton-type are generally cut.

A fleece is produced in the conventional way from the thus-obtained staple fibres. This fleece may be aerodynamically produced, although it is also possible to use a card. The fleece may have a weight per unit area of from 50 to 500 g/m². However, the weight per unit area of the fleece is preferably from 100 to 400 g/m².

The fleece is then needle punched in known manner. By appropriately selecting the needle punching conditions, it is possible to adapt the properties of the fleece to the intended purpose.

In general, needle punching is carried out using a high punch count. Thus, punch counts of from 500 to 1500 per square centimeter are particularly suitable. Needle punching provides the fleece with a high density and re-orientates the fibres to a considerable extent perpendicularly of the plane of the fleece. This is important, *inter alia*, to the pile of the end product.

The thus-obtained fleece is then subjected to a treatment in which its density is increased by more than 30% by high overall shrinkage and in which the multicomponent fibres are completely or partly divided into the individual components thereof. This requires a treatment agent, particularly an organic liquid, in which the individual components show a difference in shrinkage of at least 10%. Organic solvents which reduce the zero shrinkage temperature of the polyester used by at least 160°C are particularly suitable for this purpose. Such solvents include the organic solvents listed in the above-mentioned reference, namely methylene chloride, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane and chloroform, methylene chloride being preferred.

Initiation of the shrinkage in which satisfactory splitting of the fibres is obtained is also possible using dimethyl formamide at a temperature of at least 120°C.

Where copolyamides are used as components, splitting using water is also possible. The production of corresponding multicomponent fibres using copolyamides as one component and the splitting of multicomponent fibres using water are described in published G.B. Patent Application No. 2,043,526.

For treatment with the liquid which is intended to initiate shrinkage and hence *inter alia*, splitting of the multicomponent fibres, it is sufficient, for example where methylene chloride is used, for the needle-punched fleece to be briefly passed through a bath containing the treatment liquid. However, the fleece may also be sprayed of the solvent applied in another way. After the treatment with a liquid during which the fibres are completely or partly split into the individual components, the fleece is freed from the solvent as far as possible, for example by squeezing out.

The temperature of the treatment liquid is generally from 20 to 40°C. The treatment time ranges from a few seconds to a few minutes, depending upon the density and the thickness of the needle-punched fleece. Squeezing out of the solvent may be controlled by the squeezing pressure or by the gap width of the rollers used for squeezing. In certain cases, it is also possible to remove the solvent without applying pressure, i.e. by suction.

During the treatment with the liquid, it is important to pass the fleece through the bath as free from tension as possible or to treat with the solvent in the absence of tension, for example by spraying, in order thus to obtain as high a shrinkage as possible. In this way, the fleece may generally be made to shrink to the same extent in the longitudinal and transverse directions. A surface shrinkage of generally more than 30%, preferably of as high as from 35 to 55% is obtained by this treatment. However, the thickness of the fleece remains substantially constant. Accordingly, density increases considerably during the shrinkage treatment. Densities of more than 0.15 g/cc, preferably more than 0.25 g/cc, may be adjusted.

The following specialised effects are obtained by this particular kind of shrinkage. Compared with a product characterised by little or no shrinkage, the pile density may be increased by more than 50% and even by as much as 100% or more. The "pile density" is to be understood to be the number of small hairs projecting from the end product per square millimetre. For example, it is possible to obtain pile densities of 450/mm² and higher.

In addition, the density of the fleece is higher at its centre, decreasing outwards, i.e. to its upper and lower surfaces, so that a corresponding density gradient is also present in the end product. Accordingly, the density of the end product also decreases from the middle outwards. As a result, the end product has a firm, but supple feel.

The material is relatively easy to compress to begin with, but thereafter offers increasing resistance. By virtue of its higher recovery power, it returns readily to its starting position. Accordingly, it behaves in very much the same way as natural kid suede.

The end product has an overall density of at least 0.25 g/cc, preferably more than 0.3 g/cc.

Additives may be added to the treatment bath, which contains methylene chloride, for example, to reduce the adhesion between the polyurethane to be applied in the next process step and the fibres. In this way, it is possible to make the feel of the end product softer and to give the suede a more textile-like appearance. In particular, it is also possible in this way to influence the suppleness of the end product. Accordingly, film-forming brightening agents soluble in methylene chloride are preferably added to the methylene chloride treatment bath. Such brightening agents are for example, the product currently obtainable from BASF under the trade name of "Soromin AF". Brightening agents of this type are products which by nature are fatty acid condensation products. In general, it is sufficient to add only a small quantity, for example from 0.5 to 5%, of the brightening agent to the methylene chloride bath.

Needle punching to which the fleece is subjected before being treated with the shrinkage agent serves the purpose of mechanically consolidating the fleece. The density and mechanical strength of the fleece are improved in this way. In addition to needle punching, it is also possible to consolidate the fleece by treatment using air jets or water jets. However, needle punching is the preferred process for mechanical consolidation.

After it has been treated with the shrinkage agent, the fleece is dried, preferably in air at a temperature of from 50 to 80°C. However, the temperature may also be increased to about 180°C. In some cases, it is advisable subsequently to loosen the structure of the fleece of the split fibres, for example by subjecting the fleece to a shearing treatment on rollers. It is also possible to loosen the fleece by subjecting it to a second, less intensive needle punching treatment. A milling treatment may also make the structure looser.

In some cases, it is advisable to intensify the splitting process by applying an additional mechanical treatment during the use of the shrinkage agent. It is particularly favourable to subject the fleece to an ultrasonic treatment during its treatment with the shrinkage agent. One such process is described in published G.B. Patent Application No. 2,015,421.

The fleece obtained in this way, which consists of completely or partly split multicomponent fibres, is then impregnated for example by immersing the fleece in a solution based on polyurethanes. The polyurethanes used are polyurethanes obtained polyglycols, diisocyanates and low molecular weight glycols as chain-extenders. Polyurethanes of this type are preferably produced in accordance with the teaching of German Offenlegungsschrift No. 2,409,346, polytetramethylene glycol preferably being used as the polyglycol and ethylene glycol being used as the low molecular weight glycol. The diisocyanate used is in particular 4,4'-diphenyl methane diisocyanate.

The fleece may be impregnated in different ways. In one suitable process, the fleece is passed, substantially free from tension, through a bath containing the polyurethane solution. The temperature of the polyurethane solution used for impregnation is higher than room temperature and higher than the gel-forming temperature of the polyurethane solution and is preferably from 40 to 70°C. It is possible in this way to reduce the viscosity to about 0.5 Pa.s which provides for rapid and effective impregnation of the fleece.

The fleece is preferably passed downwards through a bath containing the polyurethane to be applied and then removed from the bath around corresponding guides. After leaving the bath, the fleece is guided to a pair of rollers where the roller gap is adjusted in such a way that from 100 to 500% of the polyurethane solution remains in the fleece.

After squeezing, the fleece is delivered to an air chamber at room temperature in which the viscosity of the solution increases drastically to the point where coagulation takes place to a certain extent. The fleece is then delivered to a coagulating bath containing a non-solvent for the polyurethane. It is preferred to use a bath which contains water and optionally a proportion of polyurethane solvent.

The "gel-forming" temperature or the "gel point" is the temperature at which the polymeric solution separates into two phases, i.e. the so-called "precipitation point" at which polymer droplets are just formed. The gel point depends upon the temperature, the concentration and the proportion of non-solvent, for example water, in the solution. Thus, a gel point may be adjusted by adding water to a polymer solution which is homogeneous and constant at room temperature until phase separation occurs. Phase separation may be intensified by the addition of more water or by reducing the temperature.

It is possible by heating a polyurethane solution which has separated into two phases to convert the two-phase mixture back into a homogeneous polymeric solution. Polyurethane solutions which form gels on cooling to room temperature are used for impregnation.

The coagulation process triggered off by the air cooling operation is completed in the coagulating bath, also known as the "precipitation bath". It is preferable to use several baths arranged one behind the other. The first precipitation bath may contain tempered water, for example water tempered to about 30°C. In this connection, it is important for the temperature of the first bath to be below the gel point, i.e. below the gel-forming temperature, of the impregnating solution used. This result may be achieved by using a bath

consisting of, for example, 80% of water and 20% of a solvent for the polyurethane, for example dimethyl formamide. The effect of this procedure is, *inter alia*, that the polyurethane assumes a microporous structure and that, in addition, the adhesion between the polyurethane and the fibres is reduced by the formation of tube-like or tunnel-like voids in which most of the fibres are accommodated with room to spare.

The second precipitation bath does not need to be tempered and is generally at room temperature. To complete coagulation it is generally sufficient for the fleece to be passed after impregnation through two precipitation baths before it is delivered to a washing bath. Washing is generally carried out using heated water, for example using water heated to a temperature of from 40 to 50°C. The use of several washing baths may be advantageous.

After washing, the impregnated fleece is dried. The drying temperature should preferably not exceed 100°C. The dried fleece is then smoothed on one or both sides. If desired, the product may be split one or more times before smoothing so that a thinner sheet-form material is obtained.

In addition to the immersion process described above, the impregnating composition may also be applied by other processes, for example by coating or spraying. A process in which the coating or impregnation is applied by means of a so-called "reverse-roll coater" is also particularly suitable.

In addition to polyurethanes in which diphenyl methane diisocyanate is used as the diisocyanate, polyurethanes containing dicyclohexyl methane diisocyanate as the diisocyanate component are also suitable. Conventional additives, for example pigments, silicone oil, fillers, such as calcium carbonate, air entraining agents, such as sodium sulphate, stearyl alcohol, light stabilisers, for example the product currently available from Ciga Geigy under the trade name of "Irganox 1010", and other stabilisers, may be added to the polyurethane used for impregnation.

The fleece may also be asymmetrically impregnated by adjusting a different concentration of impregnating agent, i.e. an impregnating agent gradient, in the fleece. This may be done, for example, by guiding the impregnated fleece over a sharp edge or a bar of small diameter. In this way, the side which passes over the sharp edge or the bar is compressed with the effect that, once it is travelling in a straight line again, the fleece contains less polyurethane in the places where it was compressed. This side of the fleece also contains less polyurethane than the opposite side after coagulation. In this way, it is possible to control the unrolling behaviour of the suede, its creasing behaviour and various other properties. The layer which contains less polyurethane is the pile side in the end product. Such products are characterised by an asymmetrical structure.

Smoothing, whether on one or both sides, may be carried out by means of conventional drum smoothing machines or other machines provided with corundum or other materials for smoothing. An object of the smoothing operation is to adjust the final thickness of the suede-like product. At the same time, optimal pile formation is obtained by smoothing.

The surface of the suede-like product may be textured and patterned before and after smoothing, for example by embossing using calender rollers.

The product according to the present invention may be dyed and finished by conventional methods. By virtue of the resistance of the polyurethane used to hydrolysis, dyeing may readily be carried out under HT-conditions, an improvement in feel being obtained at the same time. By virtue of the high melting point of the polyurethane, transfer printing is also possible without the product being hardened in any way.

The sheet-form material may readily be split one or more times before or after dyeing by means of machines of the type commonly used in leather industry. In this way, it is possible to make the production process particularly economical and to obtain various thicknesses and surface finishes.

The conventional finishing processes, such as brushing, roughening, smoothing, dubbing, tumbling, milling and hydrophobising, may be carried out by known methods.

The suede-like product according to the present invention shows a large number of surprising properties. Thus, it offers interesting dyeing possibilities. Various colour effects may be obtained because it is possible to carry out a dyeing treatment in which the fibres are not dyed, while the polyurethane is dyed. Thus, it is possible for example, to use pigmented polyurethane and to leave the fibres undyed. By using dispersion dyes, the polyester may be correspondingly dyed and the polyamide component left undyed. Attractive effects may be obtained in this way.

The surface creates a very live impression and has an outstanding writing effect. This "writing effect" is to be understood to be the phenomemon whereby the position of the pile hairs is permanently altered by brushing a finger, for example, over the sheet-form material, so that a distinctly visible trace is present. By the writing effect, the suede receives a very live appearance.

In addition, the suede product according to the present invention combines suppleness with high strength.

The draping properties of the suede are excellent. It may be used in a variety of different fields, for example in the manufacture of clothing, for example coats, jackets, dresses and caps. It is extremely comfortable to wear and is distinguished by high breathing activity.

By virtue of the high mechanical strength and minimal wear of the material, it is possible to produce articles of clothing which may be worn over relatively long periods without becoming unseemly.

The production process is uncomplicated,

highly economical and very kind to the environment. Thus, there is no longer a need for the fibres to be pretreated with polyvinyl alcohol or water-soluble sizes before impregnation with polyurethane or to be washed with water after they have been impregnated. The splitting of the multicomponent fibres into matrix and segments, which is simultaneously combined with an advantageous shrinkage and condensing process, may be carried out simply, safely and effectively. In addition, there is no loss of material during splitting. No problems arise when is comes to working-up. In addition, the process enables impregnation to be carried out quickly and uniformly.

The present invention is illustrated by the following Example:

Following the procedure described in published G.B. Patent Application No. 2,015,421 a matrix-segment filament having the cross-section shown in Figure 6 (individual denier 1.7 dtex) is spun from polyethylene terephthalate (relative viscosity 1.63) and polyamide-6 (relative viscosity 2.5) in a ratio, by weight, of 80:20 using a 150-bore spinneret.

The spun filament is taken off at a rate of 1500 metres per minute and drawn in a ratio of 1:3.3. The shrinkage of the filament in methylene chloride is of the order of 24%. The bundles of filaments obtained are doubled to form a tow of 51,000 dtex, passed through a brightening bath and then compression-crimped in a Turbo-crimper. The tow is crimped with an arc count of 110 arcs/100 mm and a crimp contraction of 10.3%. After drying at 50°C, the crimped tow is cut by means of a fibre cutter to a staple length of 40 mm.

A fleece is produced by carding from these as yet unsplit cardable multicomponent fibres (weight per unit area 180 g/m², 2×12 layers of 7.7 g/m²). By needle punching using number 43 needles, a punch count of 1000/cm² and a weight of 120 g/m² for a fleece density of about 0.17 g/cc is obtained after some 16 passages.

The thus-produced fleece is shrunk to a considerable extent to fibrillate the matrix-segment filaments and to increase its density. To this end, the fleece is passed in a loose, tension-free state through a methylene chloride bath having a temperature of from 25 to 30°C. After a residence time of about 30 seconds, the treatment is largely complete. The methylene chloride is squeezed off by means of a pair of squeezing rolls. From 100 to 150% is left behind, based on the weight of the fleece. This quantity is removed by drying at about 80°C and recovered.

Fibrillation and surface shrinkage lead to distinct increase in the density of the fleece (approximately 0.27 g/cc) which is reflected in a compact feel and a dense needle pattern. The uniformity, felting and softness of the fleece after the treatment are particularly impressive. There is no significant change in the thickness of the fleece. Shrinkage: approximately 19% lengthwise, 24% across, surface shrinkage: approximately 40%. The strength of the fleece is increased both as a result of its felting and by the relatively high number of fibrils per unit volume.

The fleece is then passed through a 10%, pigmented polyether urethane solution dimethyl formamide containing 4% of water. This solution has a gel point of approximately 35°C. To guarantee effective penetration of the polyurethane solution, the impregnating solution is tempered to about 55°C. As a result, the viscosity of the solution is reduced to about 5 poises. A filling of about 300% is adjusted by the squeezing gap. After leaving the impregnating bath the product cools in air, its temperature falling below the gel point. The effect of this is immediate stabilisation of the sheet-form material by the resulting increase in the viscosity of the gel to more than 50 poises and a microporous coagulation structure with minimal adhesion to the fibres. Coagulation is completed in a bath containing a mixture of dimethyl formamide and water in a ratio of about 20:80 at a temperature of about 30°C. The material is then washed first in cold water and then in water heated to 40°C until the dimethyl formamide has been completely removed, followed by drying at 100°C.

The thus-obtained product is given suede-like character by smoothing both sides by means of a drum-smoothing machine covered with number 120 paper. The pile is thus brought out and the suede-like surface developed. The fine fibrils, the large number of needles and the distinct increase in density during the splitting process together produce a dense pile having an alive writing character.

The thus-obtained product has a density of approximately 0.4 g/cc and a polyurethane content of approximately 22%.

The fibres of the product are dyed by Ht-dyeing and the supple feel developed in a jetapparatus.

By brushing or rubbing with number 180 paper, the pile is straightened again, giving a product which has an attractive appearance and feel combined with good wearing properties.

Claims

1. A suede-like product based on a polyurethane-impregnated sheet-form textile, wherein the sheet-form textile is a needle-punched fleece of completely or partly split stable fibres of crimped multicomponent filaments of the matrix-segment type of the components polyester and polyamide, of which the cross-section in the unsplit state comprises, in addition to the matrix, at least six peripheral segments of wedge-shaped or lens shaped cross-section which are not completely surrounded by the matrix, the denier of the unsplit filament amounting to from 0.5 to 10 dtex and the denier of the matrix and the denier of the individual segments amounting to from 0.1 to 1 dtex, the segments showing a difference in shrinkage of at least 10% in relation to thematrix, the multicomponent fibres being arranged at least partly in bunches in the fleece, the

polyurethane being synthesised from polyglycols, diisocyanate and low molecular weight glycols as chain extenders and the fibres, over at least 30% of the surface thereof, having no permanent bond with the impregnating composition surrounding them.

2. A suede-like product as claimed in claim 1 wherein the denier of the unsplit filament is from 1 to 5 dtex and the denier of the matrix and a denier of the segments is from 0.1 to 0.5 dtex.

3. A suede-like product as claimed in claim 1 or claim 2 wherein the polyester component makes up at least 10% of the cross-section of the unsplit fibre.

4. A suede-like product as claimed in any of claims 1 to 3, wherein staple fibres having polyamide segments which are shrunk at least 20% more then the polyester matrix are present.

5. A suede-like product as claimed in any of claims 1 to 3 wherein multicomponent filaments having a polyamide matrix and peripheral polyester segments are present.

6. A suede-like product as claimed in claim 5 wherein polyester segments which are shrunk at least 20% more than the polyamide matrix are present.

7. A suede-like product as claimed in any of claims 1 to 3, 5 or 6 wherein multicomponent filaments having polyester component which makes up from 70 to 90% of the cross-section of the unsplit fibres are present.

8. A suede-like product as claimed in any of claims 1 to 7 wherein polyester components of copolyesters are present.

9. A suede-like product as claimed in claim 8 wherein copolyesters based on terephthalic acid ethylene and butylene glycol are present.

10. A suede-like product as claimed in any of claims 1 to 5 or 7 wherein a copolyamide component based on ε-caprolactam and adipic acid/hexamethylene diamine salt is present.

11. A suede-like product as claimed in any of claims 1 to 10 wherein the impregnation is of polyurethanes based on polytetramethylene glycol, ethylene glycol and 4,4'-diphenyl methane diisocyanate.

12. A suede-like product as claimed in any of claims 1 to 11 wherein the overall density is at least 0.25 g/cc.

13. A suede-like product as claimed in claim 12 wherein the density is at least 0.3 g/cc.

14. A suede-like product as claimed in any of claims 1 to 13 wherein a density gradient having a density values decreasing from the middle of the impregnated fleece to its upper and lower surfaces is present.

15. A suede-like product as claimed in any of claims 1 to 14 wherein a microporous impregnating composition which at least partly surrounds the fibres in tube-like fashion, the lumen of the tube section surrounding the fibres being greater than the volume of the surrounded fibres present.

16. A suede-like product as claimed in claim 15 wherein the lumen of the tube section is at least twice the volume of the surrounded fibres.

17. A suede-like product as claimed in any of claims 1 to 16 wherein the surrounded fibres are not for the most part permanently bonded to the impregnating composition surrounding them.

18. A suede-like product as claimed in claim 1 substantially as herein described.

19. A process for the production of a suede-like product as claimed in claim 1 by producing a sheet-form textile from multicomponent fibres and impregnating it with a polyurethane solution, wherein a fleece is produced from staple fibres of crimped multicomponent filaments of the matrix-segment type, the cross-section of the filaments, in addition to the matrix, comprising at least six peripheral wedge-shaped or lens-shaped segments which are not completely surrounded by the matrix, the thus-produced fleece is mechanically consolidated, condensed by more than 30% by shrinkage and at the same time the multicomponent fibres are completely or partly divided into the components, the difference in shrinkage between the components amounting to at least 10%, after which the fleece is impregnated with a solution of polyurethanes based on polyglycols dissocyanates and low molecular weight glycols as chain-extenders, of which the gel-forming temperature is higher than room temperature and higher than the temperature of the coagulating bath used, the polyurethane is coagulated by cooling in air and/or by treatment with a coagulating bath which contains a non-solvent for the polyurethane, and the fleece is smoothed on one or both sides after washing and drying.

20. A process as claimed in claim 19 wherein the fleece is mechanically consolidated by needle punching.

21. A process as claimed in claim 19 or claim 20 wherein the fleece is split one or more times before or after impregnation.

22. A process as claimed in any of claims 19 to 21 wherein staple fibres of compression-crimped multicomponent filaments are used.

23. A process as claimed in any of claims 19 to 22 wherein multicomponent filaments are used of which the components show a difference in shrinkage of at least 10% when treated in methylene chloride at room temperature.

24. A process as claimed in claim 23 wherein the difference in shrinkage in methylene chloride amounts to at least 20%.

25. A process as claimed in any of claims 19 to 22 wherein multicomponent fibres are used of which the components show a difference in shrinkage of at least 20% when treated with water.

26. A process as claimed in any of claims 19 to 25 wherein multicomponent filaments having a matrix component of polyamide and peripheral segments of polyester are used.

27. A process as claimed in any of claims 19 to 26 wherein the polyester makes up from 70 to 90% of the cross-section of the multicomponent filaments.

28. A process as claimed in any of claims 19 to 27 wherein a solution of polyurethanes based on polytetramethylene glycol, ethylene glycol and diphenyl methane diisocyanate is used for impregnation.

29. A process as claimed in any of claims 19 to 28 wherein methylene chloride is used for initiating shrinkage.

30. A process as claimed in claim 29 wherein the methylene chloride contains from 0.5 to 5% of a brightening agent soluble in methylene chloride.

31. A process as claimed in any of claims 19 to 28 wherein dimethyl formamide at a temperature of more than 120°C is used for initiating shrinkage.

32. A process as claimed in any of claims 19 to 31 wherein impregnation is carried out asymmetrically.

33. A process as claimed in claim 19 substantially as herein described.

34. A suede-like product as claimed in claim 1 when produced by a process as claimed in any of claims 19 to 33.

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